

**REMARKS**

The claims have not been amended. Accordingly, claims 1-20 are currently pending in the application, of which claims 1, 17, and 20 are independent claims. Applicants request reconsideration and timely withdrawal of the pending rejections for the reasons discussed below.

***Rejections Under 35 U.S.C. § 112, first paragraph***

Claims 2, 5, 8, 13, and 14 stand rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the enablement requirement. Applicants respectfully traverse this rejection for at least the following reasons.

Despite the Office Action's continued assertions to the contrary, Applicants respectfully submit that the specification enables one of ordinary skill in the art to make and use the present invention without undue experimentation. As noted in Applicant's Reply of March 15, 2007, the specification describes the location and function of the sensor (paragraphs [0023]-[0025] and [0028]), the structure and operation of the two embodiments of the sensor (paragraphs [0029]-[0030], [0036]-[0037], and Figs. 3-4), and the material of the sensor's pressure film or pressure member (paragraphs [0030] and [0036]). Furthermore, paragraphs [0032] and [0039] and Figs. 5-6 show the substantially linear relationship between the sensor's volume change and fuel concentration in a certain concentration range and show that the sensor's volume does not change over time.

Furthermore, contrary to the Office Action's conclusion, the specification describes how a change in volume is correlated to concentration in such a way that enables one of ordinary skill in the art to make and use the present invention without undue experimentation. For example, in one embodiment, the sensor 103 includes an electronic circuit that detects a change in the volume of the sensor 103 and converts it into an electrical signal (paragraph

[0024]). The electronic circuit in the sensor outputs the electrical signal to the control unit 113, which converts the electrical signal it into a concentration value of the fuel mixture (paragraph [0025]). To this end, the control unit 113 may include a calculator that calculates the concentration of the fuel mixture using the electrical signal and a comparator that compares the calculated concentration of the fuel mixture with a previously stored reference concentration value (paragraph [0024]).

Thus, contrary to the Office Action's conclusion, Applicants respectfully submit that the disclosure describes the sensor and the relationship between the sensor volume change and the fuel concentration in such a way that enables one of ordinary skill in the art to make and use the invention without undue experimentation.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 112, first paragraph rejection of claims 2, 5, 8, 13, and 14.

***Rejections Under 35 U.S.C. § 112, second paragraph***

Claims 5 and 8 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite. Applicants respectfully traverse this rejection for at least the following reasons.

The Office Action states that the disclosure "lacks reasonable description as to how the fuel concentration is detected using the volume and dhow [sic] the sensor changes in accordance to that" (Office Action, page 6). Applicants respectfully disagree. As noted above, in one embodiment, the sensor 103 includes an electronic circuit that detects a change in the volume of the sensor 103 and converts it into an electrical signal (paragraph [0024]). The electronic circuit in the sensor outputs the electrical signal to the control unit 113, which converts the electrical signal it into a concentration value of the fuel mixture (paragraph [0025]). To this end, the control unit 113 may include a calculator that calculates the concentration of the fuel mixture using the electrical signal and a comparator that compares the calculated

concentration of the fuel mixture with a previously stored reference concentration value (paragraph [0024]).

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 112, second paragraph rejection of claims 5 and 8.

### ***Rejections Under 35 U.S.C. § 102***

Claim 1 stands rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by U.S. Patent No. 6,303,244 issued to Surampudi, *et al.* ("Surampudi"). Applicants respectfully traverse this rejection for at least the following reasons.

In order for a rejection under 35 U.S.C. § 102(b) to be proper, a single reference must disclose every claimed feature. To be patentable, a claim need only recite a single novel feature that is not disclosed in the cited reference. Thus, the failure of a cited reference to disclose one or more claimed features renders the 35 U.S.C. § 102(b) rejection improper.

Claim 1 recites, *inter alia*:

a fuel storage unit that stores the fuel to be supplied to the fuel cell stack;  
a diluent storage unit that stores *only* a diluent that is a byproduct of the chemical reaction in the fuel cell stack (emphasis added)

Surampudi fails to disclose at least these features. Rather, Surampudi discloses condensers 940 and 942 that lower the water temperature and allow both the methanol and the water from the electrode stack 924 to condense (col. 18, lines 31-35). Both methanol and water pass through the condensers 940 and 942, which the Office Action relies upon to teach the diluent storage unit of claim 1. Hence, the condensers 940 and 942 do not teach the diluent storage unit of claim 1 because the condensers 940 and 942 do not store "only a diluent that is a byproduct of the chemical reaction in the fuel cell stack". Therefore, Surampudi fails to teach or suggest each and every feature of claim 1.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 102(b) rejection of claim 1. Claims 2-16 depend from claim 1 and are allowable at least for this reason. Since none of the other prior art of record discloses or suggests all the features of the claimed invention, Applicants respectfully submit that independent claim 1, and all the claims that depend therefrom, are allowable.

***Rejections Under 35 U.S.C. § 103***

Claim 2 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Surampudi as applied to claim 1 above in view of U. S. Patent No. 6,890,674 issued to Beckmann, *et al.* ("Beckmann"). Applicants respectfully traverse this rejection for at least the following reasons.

Applicants respectfully submit that claim 1 is allowable over Surampudi and Beckmann fails to cure the deficiencies of Surampudi noted above with regard to claim 1. Hence, claim 2 is allowable at least because it depends from an allowable claim 1.

Claims 3-4 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Surampudi as applied to claim 1 above in view of U. S. Patent No. 6,686,081 issued to Gottesfeld ("Gottesfeld"). Applicants respectfully traverse this rejection for at least the following reasons.

Applicants respectfully submit that claim 1 is allowable over Surampudi and Gottesfeld fails to cure the deficiencies of Surampudi noted above with regard to claim 1. Hence, claims 3-4 are allowable at least because they depend from an allowable claim 1.

Claims 5-8 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Surampudi in view of Gottesfeld as applied to claims 1, 3, and 4 above, and further in view of Beckmann. Applicants respectfully traverse this rejection for at least the following reasons.

Applicants respectfully submit that claim 1 is allowable over Surampudi and Gottesfeld and Beckmann fail to cure the deficiencies of Surampudi noted above with regard to claim 1. Hence, claims 5-8 are allowable at least because they depend from an allowable claim 1.

Claims 9-16 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Surampudi as applied to claim 1 above and in view of U.S. Patent No. 6, 306, 285 issued to Narayanan et al. ("Narayanan"), Beckmann, and U.S. Patent No. 5,033, 293 issued to Honma et al. ("Honma"). Applicants respectfully traverse this rejection for at least the following reasons.

Applicants respectfully submit that claim 1 is allowable over Surampudi and Narayanan, Beckmann, and Honma fail to cure the deficiencies of Surampudi noted above with regard to claim 1. Hence, claims 9-16 are allowable at least because they depend from an allowable claim 1.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 103(a) rejection of claims 2-16. Since none of the other prior art of record, whether taken alone or in any combination, discloses or suggests all the features of the claimed invention, Applicants respectfully submit that claims 2-16 are allowable.

Claims 17, 18, and 19 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Narayanan in view of Beckmann and U.S. Patent Application Publication No. 2001-0037000 issued to Goto, et al. ("Goto"). Claim 20 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Narayanan in view of Beckmann. Applicants respectfully traverse this rejection for at least the following reasons.

To establish an obviousness rejection under 35 U.S.C. § 103(a), four factual inquiries must be examined. The four factual inquiries include (a) determining the scope and contents of the prior art; (b) ascertaining the differences between the prior art and the claims in issue; (c) resolving the level of ordinary skill in the pertinent art; and (d) evaluating evidence of secondary consideration. *Graham v. John Deere*, 383 U.S. 1, 17-18 (1966). In view of these four factors, the analysis supporting a rejection under 35 U.S.C. 103(a) should be made explicit, and should "identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. *KSR Int'l. Co. v. Teleflex, Inc.*, 550 U.S. \_\_\_, slip op. at 14-15 (2007). Furthermore, even if the prior art may be combined, the combination must disclose or suggest all of the claim limitations. See *in re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

There is no reason that would have prompted a person of ordinary skill in the art to combine Narayanan and Beckmann in the manner the Office Action suggests. The Office Action states that "because electrolyte membrane [250] of Narayanan '285's teaching is part of sensor element [200]. ...the sensor element disclosed by Beckmann '674 is combinable with that of Narayanan '285" (page 18, paragraph 15). Although Narayanan and Beckmann both disclose sensor devices, the sensor devices function in completely different ways. Narayanan discloses a concentration sensor that operates on the principle of the electrochemical oxidation of the fuel under mass transport limited conditions (col. 3, lines 25-30). Beckmann discloses a concentration sensor using a material that expands depending on the concentration of methanol fuel in a fuel solution and causes a change in resistance of a conductor (col. 8, lines 53-60). Beckmann uses NAFION<sup>TM</sup> as the expansion material that directly monitors the fuel concentration while Narayanan uses NAFION<sup>TM</sup> as the solid electrolyte membrane. In addition, Narayanan does not teach or suggest that NAFION<sup>TM</sup> or the electrolyte membrane changes volume depending on the fuel concentration or is used to detect the fuel concentration. Rather,

in Narayanan the mass transport of methanol to the surface of the anode controls the current, and the current indicates the concentration of methanol (col. 5, lines 1-8). Hence, it is unclear how the expansion material in the sensor of Beckmann can be combined with the solid electrolyte membrane in the sensor of Narayanan.

Furthermore, the Office Action states that “since the material used in Beckmann ‘674 and the sensor element of Narayanan ‘285 is the same, there would be a high likelihood that they would function the same way” (page 18, paragraph 15). However, Narayanan discloses that the “solid electrolyte membrane 250, preferably made of NAFION™, is pre-treated in a swelling agent such as isopropanol” (col. 4, lines 29-31). Beckmann discloses no such treatment of the NAFION™ expansion material. Since the NAFION™ of Narayanan and Beckmann are not prepared in the same way, the NAFION™ of Narayanan and Beckmann do not inherently function in the same way. Therefore, it would not have been obvious to one of ordinary skill in the art to use the NAFION™ of Narayanan as a sensor film or a sensor member as in Beckmann.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 103(a) rejection of claims 17 and 20. Claims 18-19 depend from claim 17 and are allowable at least for this reason. Since none of the other prior art of record, whether taken alone or in any combination, discloses or suggests all the features of the claimed invention, Applicants respectfully submit that independent claims 17 and 20, and all the claims that depend therefrom, are allowable.

**CONCLUSION**

Applicants believe that a full and complete response has been made to the pending Office Action and respectfully submit that all of the stated grounds for rejection have been overcome or rendered moot. Accordingly, Applicants respectfully submit that all pending claims are allowable and that the application is in condition for allowance.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative at the number below to expedite prosecution.

Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

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